

Chapter 10 – Summary and Conclusions

This study compared the operation of a roundabout to similar intersections (Analysis I) and compared the roundabout intersection to three other traffic control scenarios (Analysis II). Analysis I included the roundabout and two comparable two-way STOP intersections. Analysis II included the roundabout intersection and two-way STOP, four-way STOP and four-way STOP with separate left turn intersection control/ configuration scenarios.

Section 10.1 – Study Summary

The primary focus of this research study was to evaluate the operation and safety of an existing roundabout located in Manhattan, Kansas. The Manhattan roundabout was constructed in the fall of 1997. The roundabout operates with approximately 4,600 daily entering vehicles and 310 peak hour entering vehicles.

Analysis I examined the operation of the roundabout intersection relative to two comparable intersections. The two comparable intersections operated under two-way STOP traffic control. The two comparable intersections carried approximately 7,600 and 9,300 daily entering vehicles, and 680 to 1,030 peak hour entering vehicles. To allow comparison of the three intersections under similar traffic loadings, study hours were chosen for the two STOP controlled intersections that matched the traffic levels at the roundabout.

Intersection operation was evaluated using six measures of effectiveness (MOEs). Values for these MOEs were obtained from the computer program SIDRA. SIDRA is an Australian simulation program that can evaluate the operation of a roundabout as well as signalized and unsignalized intersections. The results of the MOE evaluation for the three intersections are shown in Table 58.

Table 58 - Summary of MOE Statistical Results - Analysis I

Measure of Effectiveness:	Statistical Result:	Traffic Control Advantage:
95 Percentile Queue	DW < CG < JP	None*
Average Delay	DW < JP < CG	two-way STOP provides less average delay
Maximum Approach Delay	CG < DW < JP	Roundabout provides lower maximum approach delay
Proportion Stopped	DW < CG < JP	None*
Maximum Approach Stopped	CG < JP < DW	Roundabout provides lower maximum approach stopped
Degree of Saturation	CG < DW < JP	Roundabout provides lower degree of saturation

From Analysis I, 95 percentile queue and proportion stopped produced statistical results that did not allow conclusions to be drawn for these two MOEs. At this traffic level, additional study is needed before such conclusions can be drawn for these two MOEs.

The roundabout produced a higher value of average vehicle delay with regard to all entering vehicles. This was the only MOE where the two-way STOP intersections were found to operate better than the roundabout. However, when the values for delay on the approach which

experienced the highest amount of vehicle delay was examined, the roundabout was found to operate better than the two-way STOP intersections.

The maximum proportion stopped and degree of saturation MOEs were found to be statistically significantly better at the roundabout over the two comparable STOP controlled intersections.

The roundabout was also evaluated against three intersection control/ configuration scenarios (Analysis II). For this analysis, the traffic levels found at the roundabout were evaluated using two-way STOP and two four-way STOP scenarios. In all but one case, the roundabout operated better than the two-way STOP control. In all cases, the roundabout was found to operate better than the four-way STOP scenarios (see Table 59).

Table 59 - Summary of MOE Statistical Results - Analysis II

Measure of Effectiveness:	Statistical Result:	Traffic Control Advantage:
95% Queue	$RA < 4L = 2S < 4S$	Roundabout
Average Delay	$RA = 2S < 4S < 4L$	Roundabout/ two-way stop
Maximum Approach Delay	$RA < S2 < 4S < 4L$	Roundabout
Proportion Stopped	$RA < 2S < 4L < 4S$	Roundabout
Maximum Approach Stopped	$RA < 2S < 4L < 4S$	Roundabout
Degree of Saturation	$RA < 2S < 4S < 4L$	Roundabout

The safety of a roundabout compared to other forms of intersection control has been shown to be safer by 40 – 70 percent in many international studies. Conflict analysis was used in an attempt to examine the relative safety of the three Manhattan intersections studied. Over 180 hours of videotape was reviewed of operation at the three intersections and only one conflict was found. This did not allow for any conclusions to be drawn for conflicts with regard to safety.

A before and after study of crashes was performed for the Manhattan roundabout. In the three years prior to roundabout installation, there were nine total crashes. Of these, four involved injuries and all were right angle crashes where one driver violated the right of way of the other. In the twenty-nine months since roundabout installation, there have been no reported traffic crashes.

Section 10.2 – Conclusions

From the results of this study the following conclusions are drawn.

1. The crash experience of the Manhattan roundabout mirrors that found in available U.S. and international studies. There was an average of three per year (with 1.3 injuries per year) prior to installation. In the twenty-nine months since installation, there have been no reported traffic crashes. This reduction is statistically significant. Therefore, this roundabout has been successful in significantly reducing the number of intersection crashes.
2. The Manhattan roundabout was found to be an equal or better form of intersection traffic control when compared to comparable two-way STOP intersections.
3. The Manhattan roundabout was found to experience a higher level of average vehicle delay and a lower maximum approach vehicle delay than the two comparable two-way STOP controlled intersections.
4. The Manhattan roundabout operated better than the two comparable two-way STOP

controlled intersections with regard to degree of saturation (v/c ratio).

5. Conclusions could not be drawn with regard to the proportion of vehicles stopped at the three intersections. However, the roundabout was found to have a statistically lower maximum approach proportion stopped.
6. The roundabout operated as well as a two-way STOP with regard to average delay and better than the two-way STOP for the other four MOEs.
7. The roundabout operated better than both four-way STOP alternatives for all six MOEs used.